Migration and Regional Convergence in the European Union

1. Introduction

European migration trends in the last decade have been marked by a number of spectacular changes. In particular, in the course of the recent enlargement immigration to some EU15 countries from the EU10 has become remarkable[1]. Immigration to the UK is estimated to have accounted for some 560,000 persons in 2004-2006 (Lemos and Portes 2008) and a number of the EU15 countries, which still were emigration countries in the beginning of the 1990's such as Spain or Ireland also received substantial immigration from the EU10.[2] Similarly - although EU15 countries have clearly much higher immigration rates, - the new Eastern European member states had become net immigration countries on account of high inflows of migrants in particular form former Soviet Union countries (see OECD,2007). Nevertheless, the Central Eastern European as well as Baltic countries had then started to send continuously migrants to the EU15. At the current point in time the vast majority of the EU27 countries are net immigration countries.

At the same time, since enlargement 2004/07 the EU has to face a major cohesion problem, manifesting itself in substantial income and unemployment differences. However, over the last decade we can observe a decline in regional disparities both in per capita income as well as unemployment. Most dramatic is the decline in regional unemployment disparities which – after an increase during the economic stagnation of 2001/02 – declined substantially.

In the face of important migration flows and the cohesion problem, the question arises whether migration had an effect on unemployment and GDP per capita levels in the 2000s. This question is not easy to answer. From the point of view of economic theory migration may produce transitory employment and wage effects in highly developed open economies but no long run effects. In closed economies with rigid sectoral specializations also long run adverse effects are possible. However, a number of other factors (such as the structure of migrant flows in terms of human capital, the elasticities of substitution between natives and migrants of potentially different ages and human capital endowments, the price elasticity of labour demand, the speed of adjustment of the capital stock and the reaction of national wage setting institutions and many more) have been shown to have an impact on the sign of the long run as well as the short run effects of migration on labour markets and GDP per capita (see Borjas 2003, Ottaviano and Peri 2006 and Bentolila et al 2008, for recent discussions of the impact of some of these variables).

The question of the effects of migration on the labour market and GDP per capita is thus essentially an empirical one, with the empirical literature on employment and income effects of migration (which in contrast to numerous studies covering immigration effects

[1] Henceforth we will use EU10 for the Central and Eastern European countries acceding to the EU in 2004/07, EU 12 for all new member states 2004/07 and EU15 for countries that were EU member states already before 2004.

[2] Both countries, however, became immigration countries already in the mid 1990s. Nevertheless for Spain Bentolila et al (2008) show that the share of foreign born in the total labour force increased from below 0.5% in 1995 to 14% in 2006. For Ireland Hughes (2007) reports an increase of net migration from around 32.000 persons (up from 8.000 in 1996) just before the enlargement in 2004 to about 70.000 persons in the first half of 2006. Barrett (2009) reports 120.000 resident persons from EU10 in total in Ireland in 2006.

in the US is not too rich for Europe) following a number of different strands. One of these makes projections on the effects of migration on employment and output in simulations with Computable General Equilibrium (CGE) Models. These simulations assume competition between migrants and native labour, distinguish between skill groups, know mobility between skill groups as a reaction to immigration, permit a change in sector composition and include demand effects from the larger household sector including the migrants. Those models project small unemployment and wage effects, which can be balanced by demand effects (see: Boeri and Brücker 2005, D´Amuri et al 2010,Barrell et al 2010 for examples).

The second type of literature draws on empirically observed developments in migration, employment and wage changes and (econometrically) estimates the statistical relationships between migration and unemployment, wages or output growth. The country studies that have been produced in this literature mostly use individual labour market data and look either at the regional or micro-economic level and often distinguish between skill and age groups. Analyses with the available data incur some problematic points which have been systematically discussed but only partly solved in the literature. These studies often come to the conclusion that immigration has no or only a very small significant effect on unemployment, but affects output growth positively.

The third type of study (recently surveyed by Etzo, 2008), focuses on convergence in terms of GDP per capita and follows the results of Barro and Sala-i-Martin (2004). In a recent meta-study, Ozgen et al (2010) point out that these studies typically find that the effect of net migration on per capita income growth is positive, but small.

All these studies focus on particular countries and/or specific labour market segments. However, there is very little literature which assesses the effects of migration from a general European perspective, particularly when it comes to analysing the impact of migration on the declared policy objectives of the EU (such as cohesion and competitiveness), which thus leaves European policy makers ill prepared to assess how policies on labour mobility in the EU impact on these policy objectives. This study therefore offers an empirical, econometric analysis covering the EU27's NUTS2 regions in the 2000-2007 period.

First, we analyse to which extent migration affects unemployment, GDP per capita growth and productivity growth which we consider a "catch all" indicator for competitiveness of a region. In addition, in the case of regional unemployment we also distinguish between youth and long-term unemployment. Second we estimate the effects of migration in the case of immigration and emigration regions. Third, although the limited data availability does not permit to estimate the effects by different skill groups or different countries of origin of migrants (e.g. from other EU countries vs. the rest of the world) we highlight the pattern of migration by education group and country of origin in our descriptive analysis.

We use data from the Eurostat Regio Database and the European Labour Force Survey (ELFS). These data sets are the best available sources and an essential basis for a regional migration analysis for EU countries. Nevertheless they have certain limits which we will have to consider carefully and which restrict the issues that we can analyze. Unfortunately, we only have information on the migrant population rather than on migrant labour and poor information on migrants' country of origin and destination as well as on their skills. Despite these limitations we think it is important to go beyond the existing country level analysis and assess the impacts of migration from a European perspective.

Furthermore, we attempt to account for the estimation problems described in the literature in our specification and employ instrumental variables estimators to account for the endogeneity of migration.

In accordance with the literature we find no significant impact of migration on unemployment and youth unemployment, but a significant but small effect of migration on long-term unemployment. Migration, however, has a positive effect on GDP per capita growth as well as on productivity growth. Immigration regions experience a 0.03 per cent increase in GDP per capita and a 0.01 per cent increase in productivity when the net immigration rate increases by 1 per cent. Emigration regions loose 0.02 per cent of GDP per capita and 0.03 per cent of productivity by a 1 per cent increase in emigration. Thus we conclude that migration, since influencing productivity, evidently changes the structure of skills. It therefore has a positive effect on the competitiveness of – generally richer - immigration regions but a negative one on emigration regions. Migration therefore does not promote income convergence.

The rest of this study is organized as follows: In section 2 we describe the theoretical effects of migration and review the results of the empirical literature. Section 3 discusses data issues. Section 4 shows some empirical facts. Section 5 presents our specification and Section 6 the results of our estimations. Section 7 concludes.

2. Migration in theory and in the empirical literature

2.1 Migration effects: Unemployment and Wages

Migration is popularly considered to result in wage pressures and in the absence of wage flexibility in increased unemployment. Economic theory proposes a more thorough argument. Here immigration is assumed to comprise different skill groups. It changes the overall labour supply and if representing a particular skill group, the skill structure in the destination (and sending) region. If capital is fixed immigration to an economy with a small product range and little exposure to world trade will lead to long run employment and wage effects, whereas open economies with a rich product mix should not see such long run effects (Borjas 1999, Card 2001). Since the first type of economy has no flexibility to change its output mix, immigration affecting the skill structure will lead to long-term wage effects. In contrast, the multi product, open economy can adjust its product structure. An industry which uses a specific skill intensively will face lower wage costs if immigration occurs in that skill group. At given world prices, this industry will become more profitable, attracting more firms until the original wage level is restored. Leamer and Levinsohn (1995) call this “long run factor price insensitivity” of open economies to immigration. Nevertheless, in the short run, wages in skill groups which experience an inflow of additional labour due to immigration may be depressed. Production of goods using this skill type will become more profitable and expand output (Dustmann et al 2005 and Dustmann et al 2008).

Dustmann et al (2008) argue further that with no sectoral flexibility and if immigration concentrates for example on unskilled labour this skill segment will become more abundant which will lead to a falling wage rate in that labour market segment (or, if wages do not adjust fully to increased unemployment), whereas skilled labour becomes scarce relative to unskilled labour, which may lead to increasing wages if high and low skilled labour are complementary in production.

If, by contrast capital is mobile, in the short run, migration reduces the capital to labour ratio and thus makes labour less productive. However, since wage costs are lower, the return to capital increases. This increased profitability attracts international capital flows in open economies or increased internal investments in closed economies, which restores the capital to labour ratio and thus the productivity. As labour and capital endowments have increased, the economy has settled on a higher output level (see: Barrell et al 2010). Ottaviano and Peri (2006) estimate that capital mobility is sufficient to restore 10 per cent of the original capital to labour ratio each year.

Dustmann et al (2008) argue that immigration of a particular skill group used by an industry may also lead to the change in the employed technology in that industry as a reaction to the excess supply. An increase of unskilled workers might thus promote the use of labour intensive production methods, for example agriculture may produce more labour intensive crops if unskilled labour is plentiful. Referring to the literature Dustmann et al (2008) state that about two thirds of labour market adjustments are affected by technological change.

In summary, theory does not propose a single outcome of migration. Unemployment and wage effects may but must not occur; they can be both transitive as well as permanent. (Migration should however result in additional output as we will discuss in section 2.2).

There is a considerable empirical literature which attempts to assess the effects of migration on unemployment. A part of these studies simulate the effects of potential migration in macroeconomic and general equilibrium models to see how a migration shock works through the economy and to make projections on the effects on employment, wages and output. Another strand of literature estimates the effects of observed migration trends with econometric techniques. The issues at interest are whether migration has reduced wages and increased unemployment.

The potential high migration flows from the EU10 to the EU15 countries generated a number of studies simulating the macroeconomic effects of migration in CGE models. Boeri and Brücker (2005) proposed that an emigration of 3 per cent of Eastern European citizens to the EU15 would increase the GDP of the EU15 by 0.5 per cent. However, they admit that due to rigid labour markets in the West, unemployment could rise. Barell et al (2010) simulated the effects of EU12 immigration into the UK and Ireland and argue that unemployment might rise temporarily. Hofer (2008) simulated the effects of migration on the Austrian economy and concluded that migration would increase GDP, whereas wages and unemployment were only marginally affected.

Given that the post 2004 migration from the EU10 focused on the UK and Ireland resulting in a significant labour supply shock of 265,000 persons in the UK and 62,000 in Ireland between 2004-2006,[3] Barrell et al (2010) estimated the macroeconomic effects of these shocks in the general equilibrium model NiGEM. Without distinguishing between the skill levels of migrants, they project that emigration from the EU12 reduces their output by 1 per cent and their unemployment by 0.8 percentage points. The immigration shock would increase output in the UK and Ireland by 0.6 and 1.7 per cent respectively. Since capital adjustment requires some time, in the short run, immigration increases unemployment temporarily by 1 and 0.25 percentage points in the UK and Ireland respectively, and reduces wages.

[3] Dependent on different data bases, other sources report a significantly higher number, namely 560,000 in the UK and 120,000 in Ireland (Lemos and Portes 2008 and Barrett 2009).

Barrett (2009) simulated the macroeconomic effects of EU10 immigration to Ireland in a model which considers competitiveness on international markets as an essential requirement for a small open economy. He argues that the immigration of 180 thousand persons induced a fall in wages by 7.8 per cent and has thus permitted to maintain Irelands high growth performance at the time of immigration. He proposes that immigration led to an increase of GNP by an amazing 6 per cent.

Baas and Brücker (2010) assess the effects of immigration from the EU10 on the German and UK economy. Due to imposed labour market restrictions, in the two years following the 2004 enlargement, Germany experienced an increase of EU10 population by 82,000 persons while the UK experienced an increase by 265,000 (Barrell et al 2010). Baas and Brücker (2010) use a CGE model to assess the impact of trade, capital and migration flows triggered by enlargement simultaneously. Labour market imperfections are captured by a negative relationship between the real wage level and the unemployment rate, with the wage elasticity slightly higher in the UK than in Germany. The simulations suggest a 1 per cent increase of GDP associated with EU enlargement in both countries. However, while the increase is trade driven in Germany it is largely immigration driven in the UK. Germany would thus have benefited even more from enlargement if it had lifted labour market restrictions.

Other studies making projections on the basis of more complex structural models propose that the effect of migration depends on the skill level. D´Amuri et al (2010) start from a labour market model and estimate the effect of immigration into Germany in the 1990s. They conclude that the recent immigration had hardly any wage and employment effects on native Germans, but has lead to important cuts in employment of previous immigrants. Similarly, Felbermayr et al (2009) estimate a structural model of labour demand accounting for different skill levels and simulate the scenario of work restrictions vs their abolishment. As D´Amuri et al (2010), they find that immigration had negative wage and employment effects on incumbent foreigners but not on German nationals.

In contrast to model simulations, econometric studies based on actual developments in the data mostly fail to find any significant impact of migration on unemployment. Longhi et al (2006) review this empirical literature. They conclude that on average a 1 per cent increase of immigration reduces employment by a negligible 0.02 per cent, the impact on existing migrants being slightly higher. In Europe the effect on employment is higher, in the US this applies to the effect on wages.

Estimating the unemployment effects of immigration in OECD countries, Jean and Jiménez (2007) showed that they reveal time varying effects as well as depending on labour and product market policies of the receiving country. They found no permanent but only transitory adverse effects on unemployment. Rigid labour market policies and anti-competitive product market policies increase the duration of unemployment. Angrist and Kugler (2001) analyse whether restrictive labour market regulations (employment protection, work hour restrictions, minimum wages) have an impact on the unemployment effects of immigration for Western European countries. They find higher negative unemployment effects when employing instrumental variables (IV) estimation. A 10 per cent increase in the share of foreign workers would reduce native employment by 0.2-0.7 percentage points, with protective labour market regulations worsening the effects.

Due to the long experience of immigration and the recent wave of migrants from the EU-10, immigration into the UK has been one of the most assessed movements in recent years. In particular Dustmann et al (2005) is among the first studies to analyse wage and employment effects of immigration in the UK. They use census data and regional LFS data, covering the period from the 1970s to 1990s and point out that in order to analyse the effects of migration one should use data on unemployment and wage development in the native labour segment rather than of total labour, since total unemployment and wage would cover unemployment/wage changes in the immigrant labour force as well. Furthermore, it is necessary to account for internal migration to capture possible relocation of native labour. The authors also emphasize that results will differ according to the estimator employed, whether using levels or differences and the included control variables. They demonstrate that estimation with the appropriate fixed effects and IV to account for endogeneity of migration (low unemployment /high wage regions attract immigration) yields an insignificant coefficient of migration on unemployment. The authors investigate the unemployment effect of immigration in different subsamples divided by skills, gender, or age group. A small adverse effect on unemployment in the UK can only be found with semi-skilled workers and in the older age group above 50.

Portes and Lemos (2008) focus on the immigration from the EU10 into the UK and estimate the effects on unemployment and wages. They use monthly micro data on district level from the Worker Registration Scheme which provides information on nationality, age, sex, occupation, wage and industry sector. They point out that the key issue, is to identify which labour segments are competed by migrants. Further, they argue that estimations need to look at the correct regional aggregation level in order to assure closed labour markets. Thus they perform their estimations for different occupational groups and at different regional aggregation levels. Portes and Lemos (2008) argue that EU10 immigration to the UK concentrated on a few, closed labour markets (London and South East) where no increasing outflow of native labour was observed. Immigrants compete with low wage workers. Other regions which were practically left out by migration are taken as control groups. The authors regress changes in unemployment rate on migration and a number of controls and find no significant coefficient of migration, irrespective of the regional aggregation level. They further estimate the impact of immigration on low skilled, female and youth unemployment. They find no significant impact on the first two groups. They, however, find an increase of youth unemployment at the regional level by 0.10 percentage points arising from 1 per cent increase in migration rate.[4] Estimating the migration impact in different occupational groups again gives no evidence of significant unemployment effects.

Blanchflower and Shadforth (2009) use data from the LFS and other sources and primarily investigate the motives of EU10 migrants to move to the UK. Performing a battery of correlations in the data they show that the post 2004 immigrants from EU10 in the UK were typically in low skilled jobs and paid 8 per cent lower wages than natives. Fear of unemployment among competing, low skilled native workers led to a decline in wages in this labour segment. They suggest that recent immigration into the UK brought complementary workers, not substitutes, with a high work ethnic that raised productivity. Consequently, according to their results immigration from the EU10 has reduced both the natural rate of unemployment as well as inflationary pressures. Drinkwater et al

[4] Similar results are obtained by Riley and Weale (2006) who also find an increase in youth unemployment for the UK.

(2006) and Barrett et al (2006) point out that EU10 immigrants into the UK and Ireland became employed in low skilled jobs, despite a relatively high skill level.

Bonin (2005) starts from the suggestion of Borjas (2003) to look at skill groups to assure closed labour markets. He defines skill groups by education and work experience, when assessing the immigration effects and analysis the 1975-1997 IAB employment subsample for Germany. After an important immigration in the 1970s and a drop in the 1980s, immigration has sharply increased in Germany since the beginning of the 1990s. Unlike Borjas (2003) who concluded that immigration into the US had worsened the labour market opportunities of workers in the same skill group, Bonin (2005) finds that an increase in foreign workforce does not increase unemployment. However, it reduces wages by 10 per cent. The effects are stronger for low educated labour and short and very long work experience.

In sum, while there is substantial and in part conflicting country evidence of the effects of migration on unemployment and wages, to date there is only very little literature that focuses on this issue from a European perspective.

2.2. Migration and income convergence

A number of empirical contributions have also focused on the relationship between income convergence and migration. Etzo (2008) provides a recent survey of this literature. Starting from the postulate of neoclassical growth theory of income convergence across economies and its empirical implementation by Barro and Sala-i-Martin (1991) with the benchmark speed of convergence of 2 per cent, Barro and Sala-i-Martin (2004) suggest that migration is an important source of convergence.

The typical regression design in these studies is given by the following equation

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Thus these studies estimate regressions in which the (logarithm of the) growth rate of GDP per capita in region i over a certain time period (from t-T to t) which is denoted by $\ln(y_{i,t}/y_{i.t-T})$ is regressed on the initial (log of) GDP per capita $\ln(y_{i.t-T})$ and the average annual net migration rate[5] ($m_{i,t}$) to this region in the period t-T to t as well as a number of further control variables (subsumed in a vector $X_{i,t}$), with $\varepsilon_{i,t}$ being the error term.

If in equation (1) β is statistically significantly smaller than zero, the sample exhibits convergence. Regional disparities have decreased over the time period analysed. This parameter is used to calculate the annual convergence rate (λ) which is given

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Barro and Sala-i-Martin (2004) argue that the inclusion of migration ($m_{i,t}$) has two potential impacts on the results of convergence estimates. First, if migration is important but left aside, estimations will be biased. Including the "missing variable" migration, the bias in the convergence coefficient should disappear. This will lead to a decrease in

[5] Note that the net migration rate in a region is entered in levels and not in logarithmic form, since it can be negative and that as a rule this literature uses total net migration both (i.e. the sum of migration from other regions of the same country and from abroad).

beta. Second, the parameter γ measuring the impact of the net migration rate on regional growth is predicted to be negative since according to neoclassical growth theory migration increases the population and thus reduces the capital – labour ratio which will result in lower growth in terms of GDP per capita.

In a recent meta-study of the literature following this approach Ozgen et al (2010) survey 12 contributions yielding 67 coefficient estimates for γ and β with and without the inclusion of migration for a wide array of countries. They find that, despite substantial variation across studies, the evidence collected on this issue so far seems to weakly contradict the predictions of Barro and Sala-i-Martin (2004). According to them "the overall effect of net migration on growth in real income per capita is positive, but small" (Ozgen et al, 2010, p.25) with a one percentage point increase of migration rates increasing the per capita GDP growth rate by about 0.1 percentage points. Similarly, the estimated rate of beta convergence is slightly increased rather than decreased when the migration rate is excluded from equation (1) although here the change is only 0.03 percentage points.

A number of contributions extended on the traditional convergence regressions summarized by Ozgen et al (2010) by including additional controls for potential differences in the structure of migration. Their results are ambiguous as well. For instance Shioji (2001) finds similar results as the meta-study by Ozgen et al (2010). He, however, argues that this may be due to the net migration rate measuring two opposite effects on convergence. On the one hand the so called quantity effect, which refers to the increase in population size, works to reduce growth and foster convergence, on the other hand the so called composition effect, which refers to the human capital composition of migrants, can affect the growth rate positively and could lead to divergence if high skilled migrants move to well to do regions. However, when simultaneously controlling for both the composition and the quantity effect in convergence equations he finds that the quantity effect does not attain the correct sign either, which leads the author to conclude that the human capital composition of net migration cannot explain the positive coefficient of the migration variable on regional growth. By contrast Toya et al (2004) following a similar route as Shioji (2001) for the Philippines concludes that the composition effect of migration is of some relevance.

In a similar vein Ostbye and Westerlund (2007) argue that due to the heterogeneity of migrants moving in and out of a region the focus of the traditional convergence regressions on the net migration rate may be erroneous, since if in-migrants have a different skill structure than out-migrants, migration could have a sizeable impact on regional growth even if net migration is zero. They therefore estimate alternative models including not only net migration rates but also gross-migration (i.e. both in- and outflows of migrants). According to their results the sign of the impact of net migration rates on GDP growth depends on the specification chosen in both Sweden and Norway but also reduces the size of the convergence parameter in most specifications. When, however, extending the specification to include gross migration rates their results become much less robust and depend heavily on both the specification and country considered.

Aside from these standard convergence studies a number of authors have also followed alternative approaches to explore the relationship between migration and convergence by using altogether different methods. Borjas (2001) points out that immigration may improve regional labour allocation within an economy and thus improve its efficiency. Migration would "grease the wheels of labour markets". He argues that regional wage differences – we could also say unemployment differences – persist in a country due to

limited internal labour mobility. Immigrants, however, settle in regions which offer higher wages (have a higher marginal product of labour due to labour scarcity; we could also say low unemployment). Consequently, migration would increase the speed of convergence of labour markets. He finds that periods with high immigration to the US and labour market segments with high immigration were also periods and labour market segments in which β convergence was rapid, which suggests that immigrants from abroad may be more important for convergence of GDP levels than internal migration.

By contrast, aside from focusing on standard beta convergence regressions, Pekkala and Kangasharju (1998) consider also the impact of migration on sigma convergence by running regressions in which a region's gap (in terms of GDP per capita) to the country's leading region (which in their case is Helsinki) is used as a dependent variable. They find that this shift in measuring regional convergence does not change results much. As in the standard beta-convergence regression the impact of including the net migration rate is only minor and suggests that migration was not an important driver of income convergence in Finland.

Faini (2003) follows a somewhat more heuristic approach by dividing European regions into a set of regions in which initial GDP per capita was below the average EU level and grew by more than average in the observation period and into a further set in which initial GDP per capita was above the EU average but grew by less than average. He refers to the two sets of regions as convergent regions and all other regions as divergent. The set of divergent regions is further divided into those with initial GDP above average and above average growth and those that had below average GDP as well as below average growth. He shows that migration moved from convergent poor regions to convergent rich regions only in the 1980s but not in the 1990s. In addition he also shows that a logit analysis to predict whether a region was convergent or divergent shows a significant impact of net migration only in the 1980s, which may point to a changing role of migration as a driver of convergence over time.

Finally, DiCecio and Gascon (2010) use non-parametric techniques developed by Quah (2007) to analyse the effects of migration on income convergence in the US for the period 1969-2005. They find that the clear tendencies of polarisation found when analysing per capita personal income disappear once this indicator is weighted by population growth, which they interpret as evidence that migration is an important factor in driving convergence at least in the US.

In summary, there is by now a relatively large literature on the effects of migration on convergence, which despite substantial variations in individual findings, suggests that migration – at least in European countries - is only a minor factor contributing to convergence in GDP per capita. Interestingly, however, virtually all of this literature – when focusing on EU countries - has analyzed only convergence within individual countries and on GDP per capita, although in a European context it could be argued that freedom of movement of labour between countries could also have impacts on convergence across countries and that in the context of the objectives of European cohesion policy, focusing on the contribution of migration to convergence of other indicators, such as unemployment,- could be an important and policy relevant extension of the literature.

The only study we are aware of that analyses the link between migration and GDP per capita convergence from an EU wide perspective is Wolszczak-Derlaz (2009).[6] This study – in accordance with much of the results on a national level - finds that migration has a significant negative impact on regional GDP per capita growth and a very small negative effect on the convergence parameter.

2.2. Migration and productivity and GDP growth

A number of recent studies (Mas et al 2008, Paserman 2008, Huber et al 2010, Robinson et al 2010) also focus on the impact of migration on productivity and growth. In this literature it is often argued that a larger pool of labour is likely to have a positive effect on productivity if the quality of migrant labour improves the quality of the workforce and that the different skills that migrant labour may have, has the potential to enhance technology adoption and adaptation, either by directly contributing to innovation (Mattoo et al, 2005), or by facilitating knowledge spillovers (Moen, 2005).[7]

Lewis (2005) looking at the US manufacturing sector uses firm level data to explore the relationship between the skills mix of migrant labour. He argues that the low skill labour supply from foreign sources may potentially have an additionally negative effect, over and above the skills mix of the indigenous workforce because of the degree of path dependence in immigration waves that firms will take into account in their choice of technology use.

Quispe-Agnoli and Zavodny (2002) consider the role of immigrant labour on capital investment and labour productivity in the US manufacturing sector. They find that labour productivity is lower in both high and low skilled industries as a result of immigration. They attribute this slowdown to problems of assimilation and argue that this may in fact be a short run effect, that could disappear as migrants acquire the necessary language and social skills.

In a comparison of Spain and the UK Mas et al (2008) use both growth accounting and econometric estimation techniques to explore the impact of migrants on domestic performance. Their industry level analysis distinguishes between the two countries, where the experience with migration is extremely different. The UK has historically been the recipient of migrant labour, whereas until the mid 1990s, Spain had experienced very little. They find that the Spanish workforce demography has been significantly affected by the influx of migrants, whereas the UK has seen little change, and little effect. Taking account of the quality of labour, Mas et al (2008) find there to be a small but barely significant positive impact to immigrants in the UK, but a significantly negative impact in Spain. In addition, it is clear from the industry analysis undertaken in this paper that migrant labour is significantly industrially concentrated. Thus, skills and industry seem to be specific factors that need to be taken into consideration in any future analyses.

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[6] In addition, Bems and Schelkens (2008) look at the effects of emigration from poor countries such as the EU12 on wage rates by simulation experiments with a CGE-model. While their results show that emigration fosters wage growth and thus convergence, they, however, make no reference to the size of this effect on any individual EU country.

[7] In addition to this there is also a substantial literature devoted to the potential positive impact of migration on entrepreneurship (e.g. Wadhwa, Saxenian, Rissing and Gereffi, 2007), innovation (e.g. Hunt and Gauthier-Loiselle, 2008), foreign trade and foreign direct investments (e.g. Combes, Lafourcade and Mayer, 2005 and Kugler and Rapoport, 2005,)

Paserman (2008) takes a firm perspective to consider the impact of an unprecedented increase in the labour force in Israel on firm performance in manufacturing. She employs a growth accounting generated TFP estimate and regresses migration terms on this and finds that migrant share of the workforce is negatively associated with productivity in low tech sectors, but some indication of a positive effect in high tech manufacturing sectors. In addition, her analysis indicates that there was a negative relationship between migrant scientists and productivity in low tech sectors. Ultimately, the conclusion to be drawn from this analysis is that it is not just a question of getting high skilled migrants into the workforce, but they have to be used effectively.

Finally in a recent study Huber et al (2010) focus on the effects of migration on productivity growth on an industry level and on GDP per capita growth on a regional level. This contribution finds that migration leads to an increase of productivity growth in the European Industries which is, however, strongly contingent on the skill structure of migrants. Furthermore using regional data this study also shows that an increase in the share of high skilled migrants leads to an increase in GDP per capita growth.

3. Data set issues and available indicators

3.1 The European Labour Force Suvey

Our aim in this study is to analyze the contribution of migration to convergence or divergence between the EU NUTS2 regions in unemployment rates, per capita income and productivity. To this end we use data from two different sources. The first of these is a special extract from the European Labour Force Survey (ELFS) provided to us by EUROSTAT. This provides information on the regional stock of active aged (15 to 64 year old) native and foreign born population residing in NUTS2 regions differentiated by region of birth (natives, foreign born from other EU15 countries, from EU12 and from third countries), by educational attainment levels (tertiary educated with ISCED level 5 or more education, intermediary education level – ISCED 3 or 4, and low educated with ISCED level 2 or less) and (ILO) employment status (unemployed, employed and out of the labour force).

These data cover the period from 1995 to 2008 and allow us to calculate employment and unemployment rates as well as population shares of foreign born and natives by educational attainment, region of birth and NUTS2 region of residence in the EU. In principle this data would allow us to focus in some detail on the impact of net immigration from abroad on labour markets. Unfortunately, however, they do not provide a possibility to derive information on the emigration of natives as well as the mobility of the foreign born or natives within a country. This means that for our purposes this data omits important aspects of migration (such as internal migration and net migration of natives).

Furthermore, although we took great care to recode changing NUTS2 codes wherever possible, repeated changes in the definition of NUTS2 regions, changes in the system of encoding foreigners and labour market status as well as of the education variables in this time period lead to substantial missing data problems. In particular:

- The German Labour Force Survey does not include the question concerning country of birth, so that for this country we have no information of the foreign born.

- Data for many of the countries starts reporting a breakdown of the working age population by region of birth only in later years than 1995. This applies to Bulgaria (which reports these figures from 2006 onwards), the Czech Republic (from 2002 onwards), Estonia (1998), Hungary (2001), Ireland (2006), Italy (2005), Latvia (2004), Malta (2005), Netherlands (1999), Poland (2004), Portugal (1999), Romania (2002), Slovenia (2002) and Slovakia (2003). Thus for these countries only data from the year given in brackets could be used in our analysis.
- In addition for Cyprus the labour market status is missing before 2000, so that here we can use only observations for the time period from 2000 onwards.

In addition to these limitations, there are also a number of caveats that have to be taken into consideration when interpreting this data. The first of this is that the ELFS is a household based survey which focuses on permanent residence. This implies that temporary and irregular migration is severely underestimated. This in turn implies that the recent moves of EU12 residents to certain EU countries that were often of a temporary nature or even encompassed elements of long distance commuting may be underrepresented.

The second caveat is that as with all survey based data, the ELFS also suffers from an element of non-response. In the context of our application this is most severe with respect to the information concerning the region of birth and the educational attainment of the respondents. With respect to the education structure of the foreign born non-response rates exceed or approach the 20 percent mark in several EU12 countries (Estonia, Hungary, and Latvia) as well as Ireland and the UK, and is somewhat lower but still at around 5 per cent in Sweden. Furthermore non-response rates are below the 10 per cent mark in Denmark only in the period from 2003 to 2006, around 3 per cent in the Netherlands from 2004 to 2006 and in Luxemburg they attain a very high value in 1998. Similar observations apply to region of birth. Here in the UK Labour Force Survey over 10 per cent of the active aged do not respond to the question on region of birth. In Estonia, Latvia and Hungary this non-response rate is between 5 and 10 per cent and in Sweden this rate approaches the 5 per cent mark. In addition once more for Denmark only the years 2003 to 2006 seem to have low non-response rates and for other countries non-response rates are high for certain subperiods. This applies in particular to Finland in the years 1999/2000, France (1995 to 1997) and Luxemburg in 1998 (and to a lesser degree from 1999 to 2002).

Finally, ELFS data also represents only a sample of the population and has been subject to repeated methodological change in the period observed here. This implies that individual aggregates may be too small to allow a reliable estimate of the population size of a particular group. In this respect EUROSTAT (see http://circa.europa.eu/irc/dsis/employment/info/data/eu_lfs/index.htm) provides country specific upper and lower confidence bounds under which estimated numbers should either be highlighted to signify low reliability (upper bound) or suppressed altogether when they fall below the lower bound. Second, however, the ELFS is subject to sampling error and thus there may be large fluctuations in the estimates of the size in particular small estimation groups, which are likely to be aggravated by changes in definitions.

3.2 EUROSTAT – Regional data

The second data set we use is the EUROSTAT Regio Database as provided on the EUROSTAT homepage. We use this to construct our dependent and most of our independent variables for analysis. In particular as dependent variables we use the

- **Unemployment rate** – which is calculated from data on the economically active (employed and unemployed) and unemployed as the unemployment rate of the 15-64 year olds (ur_tot) and is measured on a scale from 0 to 1
- **Youth unemployment rate** - which is calculated from data on the economically active and unemployed (in levels) as the unemployment rate of the 15-24 year olds (ur_y) and is measured on a scale from 0 to 1
- **Long-term unemployment rate** – which is calculated as the number of long-term unemployed in total economically active and is measured on a scale from 0 to 1
- **GDP per inhabitant at PPS** calculated from the indicator on GDP at purchasing power standards in million € and the total average annual population and measured in 1000 Euros per inhabitant and year (gdp_inh_pps)
- **Labour productivity -** which we proxy by real GDP per employed (which is taken from the Cambridge Econometrics database) measured in million Euros (prod).

These data are also characterized by some missing data problems in particular in Denmark, Germany and the UK. We miss data on the unemployment, youth unemployment and long-term unemployment rate for individual years in 7 regions in Germany and 2 regions in the UK, and for Denmark we miss all regional information before 2007. We deal with these problems in different ways. For those regions where only a few years are missing (i.e. Germany and the UK) we extra- (or intra-) polate the relevant information based either on the information available from higher tier (NUTS1) regions and/or a time trend.[8] For the Danish data we take national data. This gives us a complete panel of observations on unemployment for the years 2000 to 2009 which includes all countries but Bulgaria (where the beginning date is 2003). With respect to GDP per capita we miss observations only for 2 regions in Germany and the 2 regions in the UK for 1999 to 2000 and intra- and extrapolate this data in the same way as above. Hence we have a complete series of GDP per capita indicators for the time period from 1998 to 2007. For productivity, after extrapolating data for employment for 5 observations in Germany, we have a full data set.

Aside from these dependent variables EUROSTAT data also provides information about a number of migration indicators. These are the

- **Migration rate** – Since data on migration rates provided by Eurostat in many countries starts rather late (i.e. after the year 2003) or is missing altogether (Belgium, Greece and Italy) we compute the migration rate from as the difference between total population growth minus the natural population growth (i.e. live births minus deaths).[9] This is a similar indicator as the crude migration rate by Eurostat (with the correlation coefficient between the two indicators amounting to 0.99 for those cases where data is available for both indicators) but provides information for a larger number of years on a much larger number of countries. The only countries where we have missing observations are Germany and the UK. These missing data problems are due to missing information on the same regions in the same years in Germany as for unemployment data. These data are thus imputed as above. For the UK data are

[8] See the background data description in Annex I for details

[9] Note that in doing this we correct for erroneous population data and major breaks in the population series by using national data. We thank Grzegorz Gorzelak, Karol Frank and Petr Rozmahel for making us aware of a number of caveats with respect to population data from Eurostat.

missing from 2005 onwards as well as for the years 2001 and 2002. We therefore omit the UK from the analysis.

- **Arrivals, Departures and net population moves due to internal migration** – In addition to account for potential differences of the effects of internal and international migration we also use the indicator of arrivals and departures[10] due to internal migration (i.e. migration within country borders) as a percentage of the population at the beginning of the year. These indicators can also be used to calculate the net immigration rate from internal migration by taking the differences between arrivals and departures in percent of the population. This is available for many countries for the time period 2000-2007 but despite our efforts to increase sample size by incorporating other information we were unable to obtain any data for Germany, France, Greece, Ireland, Portugal and the UK. Thus we have to omit these countries from our analysis of the potential differential impact of internal and international migration.
- **Net emigration rate from abroad** – Finally, by taking differences between the imputed net migration rate and the net immigration rate due to internal migration we can also calculate the net emigration rate from abroad to a particular region. Since these net migration rates from abroad are imputed from data on total net migration and internal migration, we miss data on the same countries as for internal migration rates.

Finally EUROSTAT data is also used as information source for other factors that are likely to influence the development of regional unemployment rates and GDP growth. Indeed the literature of regional unemployment disparities has suggested a large number of different factors that may have an impact on regional unemployment. Synthesizing this literature Elhorst (2003) suggests a variety of variables, which in general have a significant impact on regional unemployment. Furthermore, the literature on growth econometrics has identified a large set of potential growth regressors (Durlauf et al 2004). Of these variables we are able to construct the following from our data sources:

- **The share of young population** – which is operationalised by the share of those aged below 25 in the population (youngsh). For which we have data from 1998 to 2009 for all EU countries, with missing observations occurring in the same German and UK regions (and years) for which we also have no unemployment rates. We thus also impute this data by the same method as above. We expect this indicator to have a positive impact on the aggregate unemployment rate since young persons are in general faced by above average unemployment rates. Furthermore we also include this indicator as a proxy for labour supply developments in a region in GDP per capita and productivity regressions.
- **Natural population growth rate** – measured as the number of births minus deaths per inhabitant at the beginning of the year (natpopgr) and with similar missing data problems as unemployment rates, which are also solved in the same way. This is used in GDP per capita regressions since (ceteris paribus) as a further proxy for

[10] Note that in the Regio database this indicator is provided excluding data for Belgium and excluding the Netherlands for the years 2000 to 2002. To complete our data, we thus augment this data with data on place to place migration available from these two countries also provided on the Regio website.

labour supply growth.[11] We expect GDP per capita to grow less rapidly in regions with more rapid natural population growth.

- **region dummies** which we use to control for time invariant amenities (such as for instance natural beauty, weather)
- **Growth of compensation** per employee – (comp_emp). We expect regions with higher compensation growth all else equal to have higher unemployment growth.
- **Share of high educated** and **Share of low educated** –- measured as the share of employed with a tertiary (ISCED 5 or more) education (highedsh) and the share with a low (ISCED 2 or lower) education (lowedsh), respectively and where missing data problems for Germany are once more solved in the same way as for data on employment and unemployment for the same regions and years as employment data. We expect that a higher share of highly skilled (or a lower share of less skilled) increases GDP growth (on account of a higher productivity of highly skilled) and reduces unemployment rate growth (due lower unemployment rates among the high skilled).
- **Sectoral shifts in employment** – which are measured by the turbulence index (i.e. the sum of absolute changes in shares over sectors of employment as compared to the previous year) (turb) calculated from employment data on a crude sectoral breakdown which differentiates between employment in agriculture, manufacturing, construction, trade and restaurants and transport (as one group), financial services and real estate, and non-market services. Here again missing data for Germany are imputed as above. We expect regions with larger sectoral shifts to have more rapid unemployment rate growth, while the impact of this variable on GDP per capita growth cannot be determined and depends on the relative productivity of growing and declining sectors.
- **Diversity** – which is measured by the inverse herfindahl index over the sectoral share (herf_inv) based on the same sectoral breakdown as the turbulence index and where missing data problems are dealt with in the same way. Here regions with higher diversity may experience lower steady state unemployment rates.
- **National unemployment rate** – which is measured in the same way as the regional unemployment rate (see above) (nat_ur). This is used to proxy for potentially time varying national factors (such as asymmetric business cycles or institutional change at the national level) influences on regional unemployment rates. It should have a positive impact on the regional unemployment rate.
- **Long-term unemployment** – measured by the share of unemployed with a duration in excess of 12 months in per cent of the labour force. This suffers from the same missing data problems as the total unemployment rate which are solved in the same way as for total unemployment data (see description above). Again this variable should impact positively on aggregate unemployment.
- **The investment rate** – which we measure as gross fixed capital formation (invest) as a share of GDP and for which we do not have any data on Cyprus and Latvia. This variable is used to proxy for changes in the capital stock and should have a positive impact on GDP growth.
- **Sectoral employment shares** – of agriculture (agsh), industry (indsh), construction (consh), tansport and trade (tradsh), financial services (finsh), non-market services (nmssh). We have no hypothesis on the sign of these variables, but use them as controls for potentially different sectoral employment and GDP developments in our regression by including at most one of these variables to avoid co-linearity.

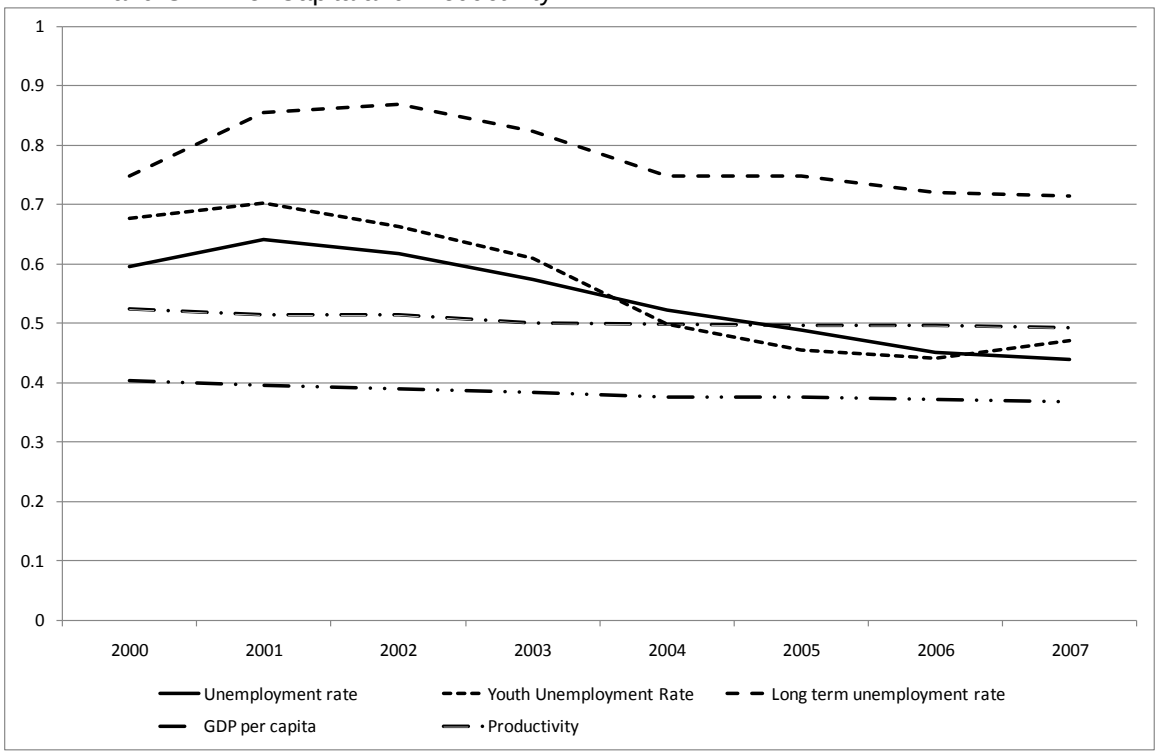
[11] Note that this is, however, a rather imperfect measure since demographic changes in labour supply are driven by changes in the active aged population.

Given the data situation we can therefore derive a consistent data set of our dependent as well as independent variables which allows us to analyze the impact of migration on regional convergence of unemployment rates (as well as youth, and long-term unemployment rates) 2000 to 2007 for all EU27 countries with the exception of Bulgaria and the UK and of GDP per capita and productivity for the time period with the exception of Bulgaria, Latvia, Cyprus and the UK. When, however, extending this analysis to account for potential differences in the effects of internal or external migration our data becomes more restricted since we have to exclude Germany, France, Greece, Ireland, Portugal and the UK. These restrictions become even more severe once we match this data with indicators on the structure of migration from abroad taken from the ELFS, since here in addition we also induce missing data problems for the Czech Republic, Hungary, Italy, Latvia, Malta, Poland, Romania, Slovenia and Slovakia so that here we miss data on 16 out of 27 EU countries.

4. Some Empirical Facts

Our regarded indicators reveal a number of interesting developments which complement our econometric analyses.

Figure 1: Development of Regional Disparities in EU27: Coefficient of Variation of Unemployment and GDP Per Capita and Productivity

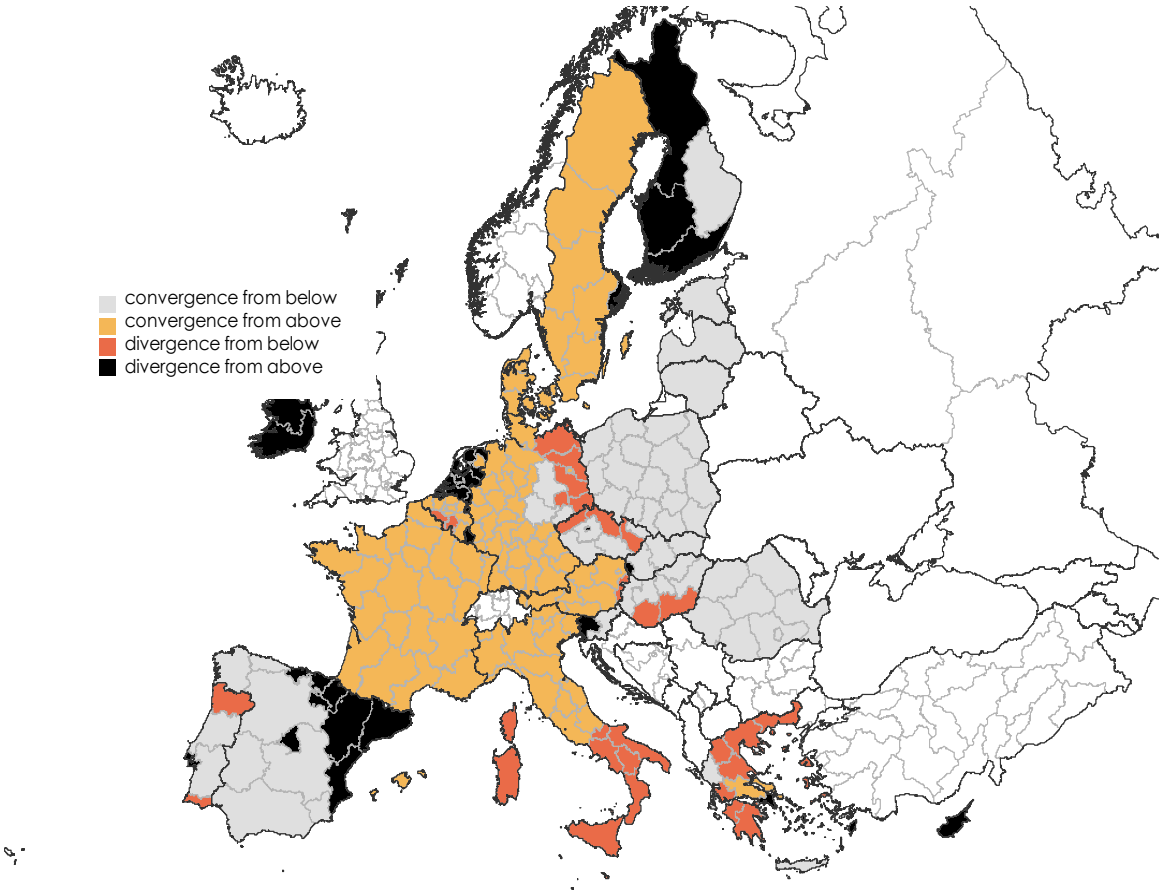


Source: EUROSTAT, own calculations.

For instance figure 1 shows the development of regional disparities in the EU27 by displaying the coefficient of variation for regional per capita income, productivity, the total unemployment rate as well as youth and long-term unemployment rates. Evidently, unemployment disparities among regions are much larger than income and productivity disparities. Youth and long-term unemployment disparities are largest, while productivity disparities are larger than those of GDP per capita. Per capita income as well as

productivity disparities are diminishing over the whole period considered, although to a modest extent. Thus there is a steady process of income and productivity convergence taking place in EU27 since 2000. Unemployment rates have converged over the whole period to a major extent, despite an apparent cyclical pattern which reveals a peak in 2002 and a new increase in 2007. Unemployment disparities are larger than income disparities in the EU one for this may be labour rigidities. The dramatic disparities in unemployment in the pre-2004 period can be attributed to the substantial unemployment in the EU12 which has piled up as a consequence of economic restructuring.

Figure 2: Convergence types among European regions

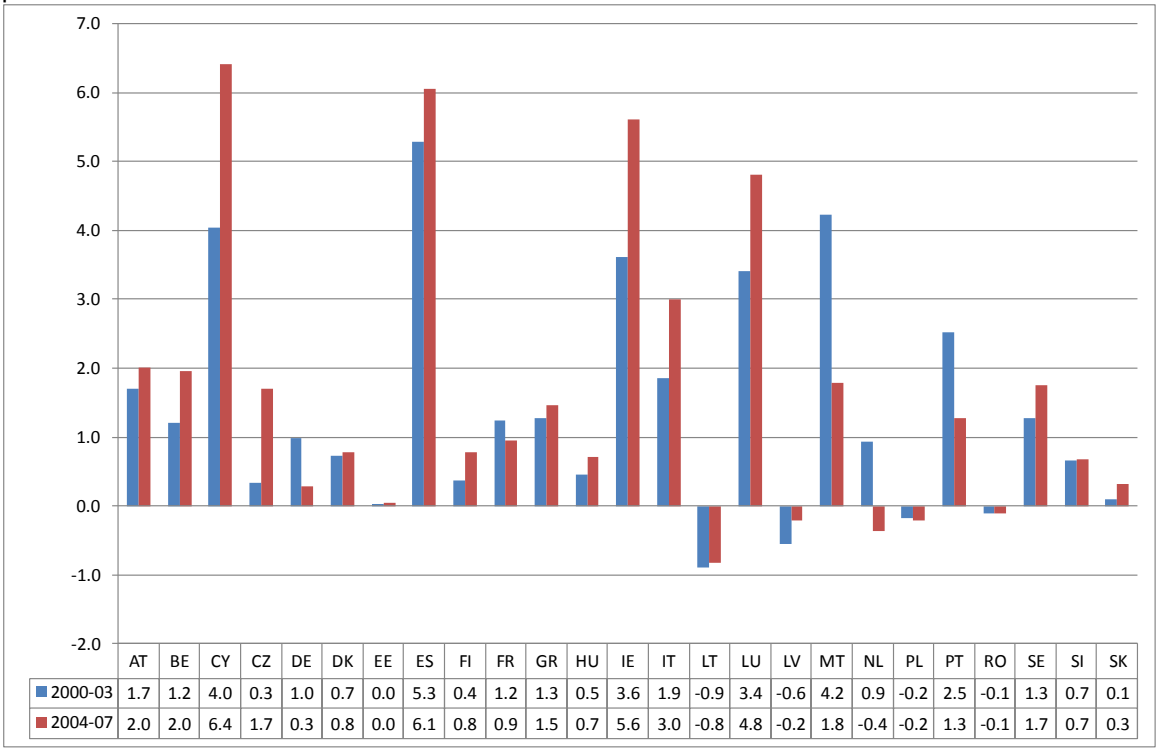


Source: EUROSTAT, own calculations Note: figure is based on average annual growth rates of GDP per capita at purchasing power parities in the time period 2000-2007 and GDP per capita level (at purchasing power standards in 2007) , Convergence from above = region has above average GDP per capita level in 2000, but below average growth rates, Convergence from below = region has below average GDP per capita level in 2000, but above average growth rates, Divergence from above = region has above average GDP per capita level in 2000 and above average growth rates, Divergence from below = region has below average GDP per capita level in 2000 and below average growth rates.

The steady income convergence process observable between EU27 regions is the result of catching up and falling behind regions. In Figure 2 we indicate the adherence of EU regions to the region types of converging and diverging regions. Converging regions are either those with a per capita income below EU average in 2000 and an above average growth rate in 2000-2007 (converging from below) or regions with an above average initial income and below average growth (converging from above). Similarly, diverging regions are either regions with a below average initial income and below average growth

(diverging from below) or regions with above average initial income and above average growth (diverging from above). We notice that the major share of Eastern European regions and the Iberian Peninsula are converging from below. In contrast, Southern Italy, the major part of Greece, several East German regions, the North of the Czech Republic and the South of Hungary are diverging from below. The main share of EU15 is converging from above. In addition a part of the EU15, (Ireland, the North-East of Spain, Cyprus, some regions of Belgium and the Netherlands as well as the majority of Finnish regions) is diverging from above.

Figure 3: Total Net Migration in Per Cent of Total Population by Country and Selected time periods



	AT	BE	CY	CZ	DE	DK	EE	ES	FI	FR	GR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	RO	SE	SI	SK
2000-03	1.7	1.2	4.0	0.3	1.0	0.7	0.0	5.3	0.4	1.2	1.3	0.5	3.6	1.9	-0.9	3.4	-0.6	4.2	0.9	-0.2	2.5	-0.1	1.3	0.7	0.1
2004-07	2.0	2.0	6.4	1.7	0.3	0.8	0.0	6.1	0.8	0.9	1.5	0.7	5.6	3.0	-0.8	4.8	-0.2	1.8	-0.4	-0.2	1.3	-0.1	1.7	0.7	0.3

Source: EUROSTAT, own calculations, Figure reports sum of absolute net migration across regions by year in per cent of total population.

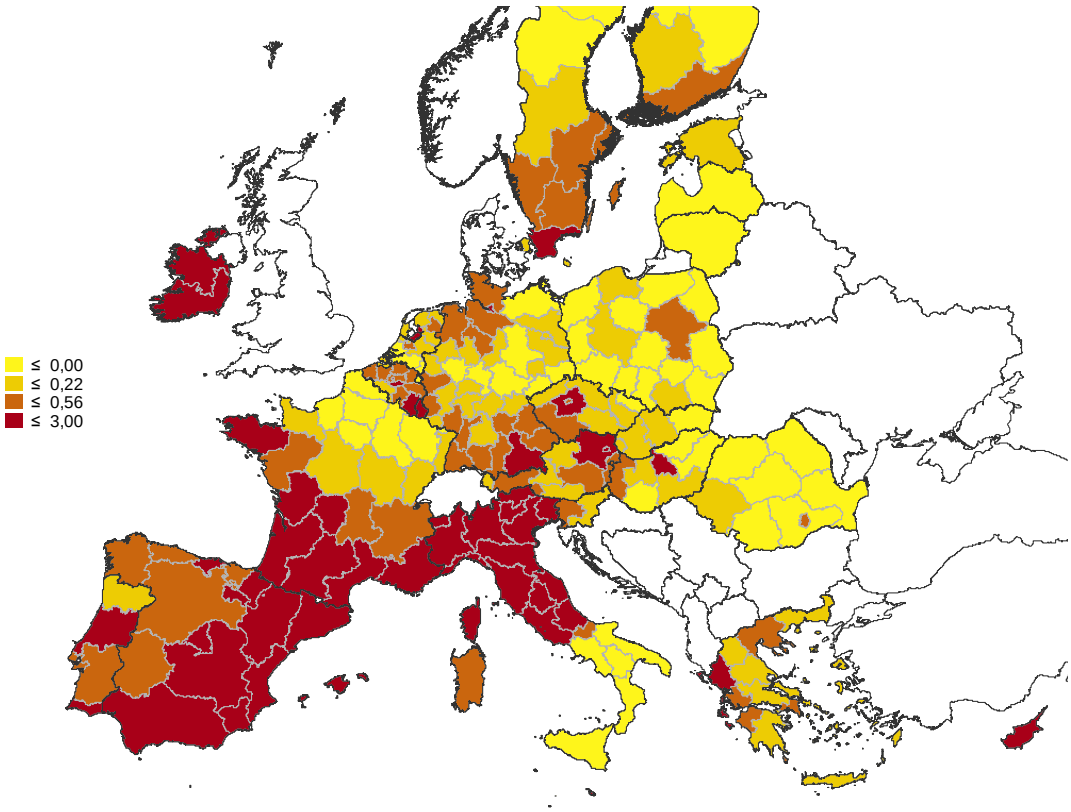
Furthermore, figure 3 provides evidence on the extent of international migration in the EU by looking at the total net migration rate by country[12]. We see a significant variation in net migration. Leaving aside the extreme cases of Malta and Cyprus that received exceptionally high immigration – they are small islands and may have attracted residents due to their attractiveness as a second domicile and as a location for headquarters - we observe that Spain, Luxemburg, Ireland, Italy and Portugal show the highest net migration rates. In the time period 2004 to 2007 between 1.9-5.3 per cent of the population immigrated to these countries.[13] Immigration rates have also been rather persistent. All immigration countries (with the exception of the Netherlands) in the period

[12] Since population data from EUROSTAT disaccords with national sources in a number of instances we checked for consistency of our migration data and corrected for discrepancies using national sources in the critical cases of Poland, Slovakia and the Czech Republic. For the other countries (in particular the EU10, the Netherlands and Cyprus) national sources are consistent with national sources and results in the literature (see e.g. Facchini, Mayda 2008),.

[13] Note that the UK which is also a candidate for high migration is not included in our sample.

2000 to 2003 were also immigration countries in the period 2004 to 2007 and also all emigration countries in the earlier period remained so later. Only the Netherlands changed from an immigration to an emigration country between the pre- and post-enlargement periods considered here. Finally, figure 3 also shows, that in contrast to the perception in the public debate also the majority of the EU12 countries (Czech Republic, Cyprus, Estonia, Hungary, Malta, Slovakia, Slovenia) are (and have been for the majority of the 2000's) net immigration countries. The only EU27 countries that are net emigration countries are Lithuania, Latvia, Poland and Romania and (since 2004) the Netherlands).

Figure 4: Total Net Migration Share



Source: EUROSTAT, own calculations. Note Figure displays total immigration or emigration in the period 2000 to 2007

Looking at total net migration not at the country but at the regional level we see that within our countries a number of regions are net emigration regions. They comprise practically entire Romania, the major part of Poland, Latvia and Lithuania, the peripheral regions of Sweden and Finland, Southern Italy and Northern France (see Figure 4). Ireland, the South and North-Eastern part of Spain, the South-West and South of France as well as North and Central Italy, and Cyprus are heavy net-immigration areas.

Table 1 shows the skill composition of international migration according to the ELFS for the years 2000 and 2008. Although we are missing quite a few observations in 2000 we see that in most countries the share of high-skilled immigrants has increased. Most notable exceptions are Spain and Lithuania. Most countries receive the largest share of immigrants in the segment of medium-skilled labour. Exceptions are Belgium, the Netherlands, France, Spain, Portugal, Italy and Greece in EU15 and Malta and Poland which received mainly low-skilled immigrants. Aside from these cases low skilled immigration has generally decreased.

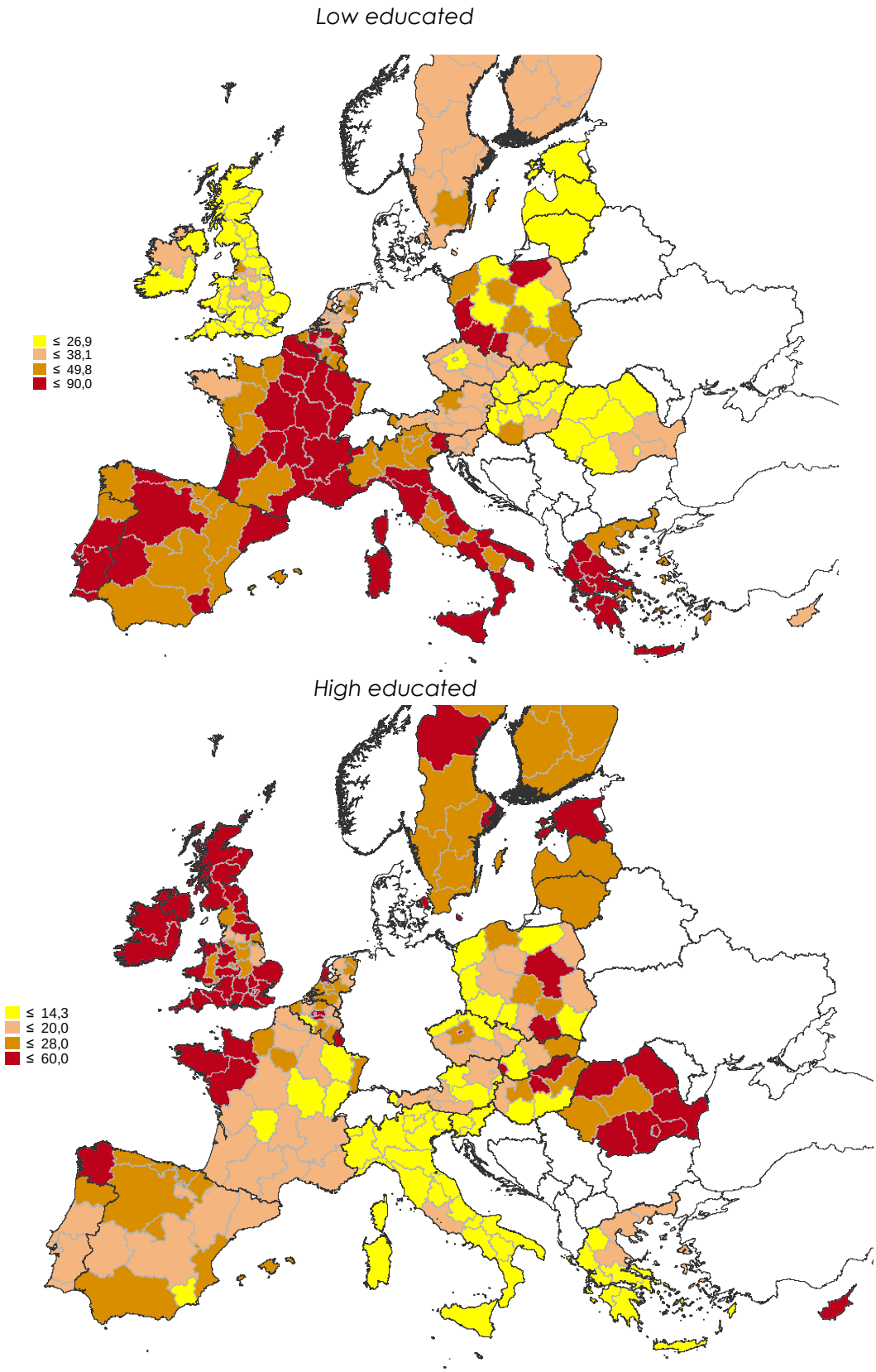
Looking at the share of highly and lowly skilled foreign born residing in the NUTS2 regions of these countries reveals some further stylized facts: In particular a high share of highly skilled foreign born is found in most of the UK regions and Sweden as well as in a number of countries with a rather low share of foreign born in total population (e.g. Romania) but also in the Baltic countries. In these latter countries high skilled migration can be associated with significant inward FDI. A high share of low skilled migrants by contrast is found in Spain, Italy and France, while the regions in the Central European Countries (Austria and the Czech Republic but also most of Hungary and Slovakia) primarily host medium skilled foreign borns. In total there thus is a clear North-South differential in the skill content of migration in the EU 27 (Figure 5). We have to note that the skill patterns for the Spanish regions are bizarre and do not correspond to the fact

Table 1: Skill Structure of Foreign Born Population by Country and Selected Years (in per cent)

	low		**Medium**		**high**	
	2000	**2008**	**2000**	**2008**	**2000**	**2008**
AT	42.0	35.6	44.8	48.2	13.1	16.2
BE	55.8	48.2	24.3	27.6	19.9	24.3
BG		19.9		47.3		32.8
CY	29.5	28.7	36.5	39.7	34.0	31.6
CZ		22.5		56.3		21.2
DK	20.9	26.8	33.4	31.5	17.2	22.8
EE	22.7	12.1	40.3	42.3	26.7	28.3
ES	49.5	45.9	23.7	32.4	26.4	20.8
FI	37.6	33.4	34.1	40.3	24.6	26.3
FR	58.9	51.8	24.2	27.5	16.9	20.7
GR	44.2	49.9	38.2	36.8	17.7	13.3
HU		20.5		46.2		24.2
IE		18.5		33.0		35.6
IT		49.0		39.2		11.8
LT	26.3	21.3	33.1	54.0	40.6	24.6
LU	50.5	36.5	28.6	32.2	18.8	31.3
LV		14.7		49.4		20.2
MT		53.3		26.8		19.8
NL	49.7	38.3	31.2	36.3	18.4	24.2
PL		41.4		42.9		15.7
PT	63.0	54.2	23.8	26.0	13.2	19.8
RO		19.0		46.3		34.7
SE	33.3	31.3	39.5	35.0	23.3	28.7
SI		33.1		55.7		11.2
SK		14.5		64.0		21.5
UK	19.8	20.4	16.1	42.1	21.1	27.5

Source: ELFS

Figure 5: Share of low and high educated workers in total stock of foreign born



Source: ELFS, Note data reports average shares for the time period 2004-2007

reported elsewhere in the literature. While the ELFS would suggest that high skilled immigration is highest in Galicia, Martin-Montaner et al (2009) for example report that high skilled immigrants are particularly found on the Baleares, Canaries, Valencia, Rioja, Madrid but not Galicia. With respect to low skilled immigrants those are located according to Martin-Montaner (2009) on the Mediterranean side but not in Castilla La Mancha and Extremadura as proposed by ELFS data.

Finally, table 2 shows the change in international migration by region of birth: EU 15, EU12 and rest of the world. The figures relate to total net migration in the segment of origin observed over the period 2000-2007 as a share of population in 2000. Clearly, migration flows with third countries are most important for EU countries. Cyprus, Spain, Austria, Sweden, the UK and Portugal have received important immigrations ranging from 2 per cent of the population in 2000 in the UK to 8 per cent in Spain. Unfortunately, other potential high immigrant countries from third countries, like Germany, cannot be included for this indicator. In Spain, the UK, Sweden, Belgium and the Netherlands immigration from EU12 follows in the second place in importance. Again, we miss the data for Ireland and Italy which should also have a noticeable share of immigrants from EU12. Luxemburg and Cyprus show important immigration from EU15.

Table 2: Change in Stock of Foreign Born Population 2000-2007
(in per cent of Total Resident Population 2000)

	pop_nms	**pop_old**	**pop_oth**
Austria	0.7	0.6	3.8
Belgium	0.3	-1.1	1.2
Cyprus	1.4	2.4	6.3
Denmark	0.1	0.1	2.8
Estonia	0.1	0.0	-3.8
Spain	2.1	0.8	8.0
Finland	0.2	0.7	1.4
France	0.1	-0.1	0.6
Greece	0.4	-0.1	1.9
Lithuania	-0.2	0.0	-1.3
Luxemburg	0.8	5.1	0.5
Netherlands	0.2	-0.1	-0.1
Portugal	0.2	0.2	2.0
Sweden	0.4	-0.1	3.7
UK	0.7	0.1	2.1
Total	0.7	0.1	2.6

Source: ELFS

5. Specification

In our empirical analysis we follow the literature on the impact of migration on convergence and estimate three central equations. The first one relates regional

unemployment rates to the lagged unemployment rate and indicators on net migration (e.g. the net migration rate or its subcategories international and internal migration) as well as a number of control variables. The second one relates GDP per capita (at PPS) to lagged GDP per capita levels as well as our measures of migration and a set of control variables, while the third one relates productivity in a region (measured as real GDP per capita) to lagged productivity, migration indicators and a set of control variables.

More specifically for each of the dependent variables (log unemployment rate, log GDP per capita and log productivity) we follow recent contributions to the convergence literature by rearranging the standard convergence equation given in equation (1) to give the following equation:[14]

(3)

Where is the respective dependent variable in region i and period t, is the lagged dependent variable in the same region, is the net migration rate of region i in period t and is a vector of control variables which may differ for different dependent variables. The are a family of region specific intercept terms which are used to control for any unobserved time invariant regional characteristics (such as for instance amenities) that may impact on the rate of growth, is a set of time specific intercepts that control common time specific shocks (such as for instance common business cycle effects) to all regions. β, γ, and λ are coefficients to be estimated and is a stochastic (i.i.d) error term.

With respect to unemployment as a dependent variable this specification is similar to that used in the literature (e.g. Lemos and Portes 2008, Borjas 1999, Card 2001 and Dustman et al 2005) where unemployment rates are related to migration and control variables. Given the objectives of this study we, however, extend this by including the lagged unemployment rate. This will allow us, first of all, to draw also conclusions whether our regions were convergent in unemployment in our observation period and, second of all, to test the impact of the inclusion of the migration rate in equation (3) on the convergence parameter (β).

For the control variables we use different variables in each equation based on previous literature. In particular, with respect to the unemployment rate – as discussed in the data section – our choice of control variables is based on the literature survey by Elhorst (2003). With respect to the GDP per capita, by contrast, we follow the literature on income convergence and include the population growth rate and investments as well as proxies for the education and age structure of the population, sectoral shares and the turbulence index. For the productivity equation we use the same variables as in the GDP per capita equation, but use the unemployment rate to proxy for labour supply.

As widely discussed in the literature, estimation of equations (3) and (4) is associated with a number of problems. The first one of these is endogeneity: Immigrants from abroad select regions of residence where they find the highest return, (i.e. those regions with low unemployment and high income - Borjas 2001). This may result in a spurious positive impact of migration on the labour market due to a reversed causality. The

[14] Note that this equation follows directly from noticing in equation (1) by —— and rearranging.

literature usually suggests solving this by instrumentation. The problem is to find appropriate instruments, with much of the literature using lagged migration rates or lags of population growth (e.g. Dustmann et al 2005, Bonin 2005). In our case since we are estimating a dynamic panel data model, we follow the suggestion of Blundell and Bond (1998), to use both the lagged levels and differences of all variables as instruments and apply system GMM using a maximum of two lags of all independent variables as instruments. This has the advantage that aside from controlling for the endogeneity of the migration variable also the endogeneity of the lagged dependent variables as well as of other dependent variables can be controlled for.[15]

A second problem is that international migration may induce internal migration flows in the recipient country. Thus assessing the unemployment impact over all regions of a country may result in a spurious positive impact of immigration on labour markets for this reason. This, however, is not relevant in the context of the present study since in all of our regressions internal migration of nationals is included in the measures of migration or as a separate dependent variable as recommended by Dustmann et al 2005.[16]

Finally, it is also important to select the right regional aggregation level to draw conclusions on migration effects.[17] The region should represent a good approximation to a closed labour market, meaning that labour would only search for work within the region. If the aggregation level is too low one will have the situation that workers might move to surrounding regions if competing with migrants. With low-skilled work the closed labour market is commonly found at a more disaggregate geographical level since low paid workers cannot afford distant commuting. We look at the regional level, NUTS2 level, since we also include all internal migrants in our regressions, the only form of mobility that could cause such bias in our application is commuting. We think, however, that given the size of NUTS2 regions this is not a major impediment to our analysis, although we cannot preclude that commuting flows are of importance in some urban-suburban contexts also in a NUTS2 specification.

6. Results

6.1 Results for Convergence in Unemployment

Table 3 presents the results of our estimates for 5 different specifications for the unemployment rate equation. In the first of these (reported in the first column) we estimate equation (3) excluding the net migration rate, in column 2 by contrast results when including the migration rate are reported. In column three we expand our baseline

[15] We also perform a number of tests to determine the validity and exogeneity of our instruments. In particular we perform the Sargan test for the exogeneity of the instruments. Here the null is exogeneity so that we do not want to reject this null hypothesis. In addition we also test for the absence of AR2 residuals. In all specifications reported below, these tests indicate both validity and exogeneity of the instruments, although in some cases we could not reject the null of AR2 residuals. We report p-values of all tests below, but do not comment on them in the text.

[16] An alternative probably superior strategy to identify effects of migration is to use the skill level of migrants distinguishing between occupational groups or different education or work experience (see: Bonin 2005, Card 2001 and Borjas 2003). We would have liked to follow this approach too, but unfortunately due to data constraints described above this avenue is not open to our analysis.

[17] Borjas (2006) recommends to analyse on county and not district level.

specification by including measures of net internal and external migration to focus on potential differences in effects of internal and external migrants.[18] We do this because external migrants moving to a region from abroad may differ from internal migrants in terms of education structure and in addition may often face problems of transferring their skills across countries on account of differences in the education system or also simply because of language problems. Internal migrants that move place of residence within a country only, by contrast, are less likely to suffer from such problems of skill-transfer. This implies that immigration from abroad may not lead to the same results as migration within a country even when the education structure of both groups of migrants is similar. Finally in columns (4) and (5) we focus on potential asymmetries of the impact among net emigration and net immigrations region as defined in figure 5 by restricting our sample to either immigration (column 4) or emigration (column 5) regions only.

The results presented in this table provide strong evidence of conditional convergence in unemployment rates among the European regions analyzed in this paper in the period 2000-2007. The coefficient on the lagged unemployment rate in table 3 ranges between 0.555 and 0.625 depending on the specification used. This implies a convergence (beta) coefficient of between -0.38 and -0.45.[19] The only results for which the estimated coefficients on the lagged unemployment rate are slightly higher (and thus convergence parameters somewhat lower) are those where we restrict the sample to either only immigration and emigration regions (columns 4 and 5). This is, however, due to the fact that in these specifications this parameter measures convergence among emigration and immigration regions only

Also the control variables included by and large accord with expectations and previous literature (see Elhorst 2003). A large share of young population residing in a region is associated with a significantly higher unemployment rate in all specifications shown in table 3. Also a higher share of agricultural employment, a higher compensation per employee, and a higher long-term unemployment rate imply higher unemployment rates and increased structural change reduces unemployment. The only somewhat surprising result is that regions with a more diverse industrial structure tend to have lower unemployment rates in our estimates. This may, however, be due to the fact that in the time period considered in our estimation industrial regions also experienced the fastest employment growth. Regions with a high specialisation in industry therefore often have lower unemployment rates in our data.

Furthermore the results suggest a rather limited impact of including migration on the parameter value of the beta convergence term, which as explained above may be considered as an indication of a minor impact of migration on the rate of convergence. The convergence parameter of the unemployment rate equation is slightly lower when including the migration rate in the equation, however, the reduction amounts to less than one standard error of the original estimate and is thus insignificant at any conventional significance level. Thus as much of the previous literature focusing on income convergence we find hardly any evidence that controlling for migration reduces the size of the convergence parameter in unemployment rates.

[18] As pointed out in the data description, this has the disadvantage that due to data constraints we have to exclude Germany, France, Greece, Ireland, Portugal as well as Bulgaria and the UK from the regression which results in a sharp drop in the number of observations.
[19] Note that these coefficients also differ significantly both from zero and unity.

Table 3: Convergence in Unemployment and Effect of Total Net Migration

	(1) excluding migration		(2) Including migration		(3) seperating internal and exterlal mig		(4) only imigration regions		(5) only emigration regions	
	Coefficient	S.E	Coeffiient	S.E	Coeffiient	S.E	Coeffiient	S.E	Coeffiient	S.E
ln(unemployment rate) lagged	0.558 ***	0.090	0.625 **	0.094	0.566 ***	0.087	0.770 ***	0.065	0.676 ***	0.160
net migration rate			0.175	0.162			0.097	0.136	0.172	0.186
net internal migration rate					0.026	0.111				
net migration rate from abroad					0.166	0.140				
national population growth	-0.491	0.363	-0.460	0315	-0.451	0.309	-0.189	0.295	-0.471	1.126
share of young population	-0.028	0.026	0.034	0.025	0.051 ***	0.020	0.015	0.329	-0.068	0.081
shareof low educated	-0.149	0.099	-0.164	0.117	0.006	0.095	-0.204 *	0.112	0.721	0.783
agriculture share	4.072 ***	1.060	1.933 **	1.006	1.076	1.031	2.122	1.478	2.557	2.367
Ln(Turbulence index)	-0.045 **	0.018	-0.036 **	0.015	-0.031 ***	0.016	-0.044 **	0.018	-0.051 **	0.020
ln(compensation per employee)	0.362 ***	0.134	0.191 *	0.103	0.287 **	0.105	0.224 *	0.129	-0.113	0.185
ln(long-term unemployment rate)	0.239 **	0.099	0.136 *	0.078	0.149 ***	0.070	0.024	0.061	0.595 **	0.245
ln(Inverse Herfindahl index)	2.324 ***	0.665	1.548 ***	0.554	1.631 ***	0.449	2.445 **	0.998	1.301	0.961
obervations	1710		1710		1072		1308		404	
p-values Hansen J statistic (overidentification test of all instruments):	0.429		0.507		0.739		0.307		0.138	
Test for Ar(2) residuals	0.045		0.011		0.023		0.01		0.026	

Notes, S.E. = heteroskedasticity robust standard errors, *** (**) (*) signify significance at the 1% (5) (10%) level respectively. All results based on System GMM estimation using a maximum of 2 lags of the independent variables as instruments

When, however, focusing on the direct effect of migration on the unemployment rate we find that although migration is on average positively correlated with the unemployment rate, this effect remains insignificant at all conventional levels of significance.[20] (The t-values for these parameter estimates are well below unity.) Furthermore, -leaving significance aside - also the coefficients imply a rather small impact of migration on unemployment rates. The coefficients imply that increasing the net migration rate to a region by 1 percentage point increases the unemployment rate in this region insignificantly by around 0.2 per cent (see column 2 in table 3).

This insignificance also applies when we split our migration measure between internal and external migration and also when splitting the sample into immigration and emigration regions. In particular when separately considering internal and foreign migrants we find that both these groups of migrants have a statistically insignificant effect on the unemployment rate although the point estimates suggest a slightly larger positive effect of migration from abroad. Similarly differentiating between immigration and emigration regions we find that there are only few differences between the results for these two region types. The only difference to previous results is that some of the control variables lose significance in these regressions and that test statistics often perform poorly in particular when considering emigration regions. This is, however, due to the severe reduction in the size of the number of observations available for these estimates, which severely reduces the variation in the data and thus complicates the identification of effects.

6.2 Impact on different labour market groups (youth unemployment and long-term unemployment)

In sum thus our evidence suggests that migration had no significant impact on the convergence of unemployment rates in the years 2000 to 2007 and that any direct effects of migration on regional unemployment rates lack significance. As, however, already pointed out in Section 5 these results may mask some important heterogeneity in the regional impacts of migration. This may apply to the impact on different labour market segments. To address this issue of potentially different impacts on individual unemployment groups we thus reformulate our analysis using both the youth unemployment rate as well as the long-term unemployment rate as dependent variables. Our hypothesis in this respect is that migrants are likely to compete most severely in the labour market with other persons entering the labour market. Therefore potential negative implications of migration on unemployment should be more easily visible among youths, who disproportionately often enter the labour market (see also Winter-Ebmer and Zweimüller, 1999 for a similar argument). Furthermore also long-term unemployed – who often suffer de-qualification through their prolonged spell of unemployment – may suffer more than proportionately from increased labour market competition, so that they too are more likely to feel any adverse effects of migration than the “average” unemployed.

[20] This insignificance of the unemployment rate is highly robust across different specifications. In particular (in results not reported here) we also estimated the specification with other instrumental variable techniques as well as without controlling for endogeneity. The only significant results we were able to obtain, was a significant negative impact of migration on the unemployment rate in uninstrumented equations. This unistrumented specification, as pointed out above, suffers from a reverse causality problem (i.e. migrants moving to low unemployment region), however.

Table 4: Effect of Migration on Youth unemployment

	(1) excluding migration		(2) Including migration		(3) seperating internal and exterlal migration		(4) only imigration regions		(4) only emigration regions	
	Coefficient	S.E	Coeffiient	S.E	Coeffiient	S.E	Coeffiient	S.E	Coeffiient	S.E
ln(long-term unemployment rate) lagged	0.616 **	0.044	0.678	0.052	0.617 ***	0.064	0.646 ***	0.055	0.620 ***	0.143
net migration rate			8.132	6.058			3.694	5.092	-1.668	5.519
net internal migration rate					1.200	7.773				
net migration rate from abroad					-0.807	2.976				
national population growth	1.104 *	0.619	1.402 **	0.583	0.778 **	0.363	1.053 **	0.548	1.984 *	0.995
share of young population	0.111 **	5.032	0.114 ***	0.034	0.102 ***	0.217	0.095 ***	0.350	0.147 *	0.798
shareof low educated	-0.385 **	0.191	-0.469 **	0.197	-0.240 **	0.106	-0.576 ***	0.234	-0.037	0.259
agriculture share	-0.886	3.175	-1.426	1.995	0.409	1.610	-2.866 *	1.696	2.022	2.058
Ln(Turbulence index)	0.060 **	0.025	0.047 **	0.021	0.042 **	0.017	0.035	0.027	-0.081	0.068
ln(compensation per employee)	-0.072	0.267	-0.061	0.195	-0.048	0.142	-0.264	0.228	0.054	0.258
ln(Inverse Herfindahl index)	0.726	1.557	-0.181	1.016	0.633	0.667	-1.007	1.763	1.966 **	0.856
obervations	1704		1704		1055		1305		399	
Tests (P-value)										
Hansen J statistic (overidentification test of all instruments):	0.892		0.287		0.494		0.147		0.145	
Test for Ar(2) residuals	0.082		0.012		0.096		0.058		0.017	

Notes, S.E. = heteroskedasticity robust standard errors, *** (**) (*) signify significance at the 1% (5) (10%) level respectively. All results based on System GMM estimation using a maximum of 2 lags of the independent variables as instruments

Table 5: Effect of Migration on Long-term Unemployment

	(1) excluding migration		(2) Including migration		(3) seperating internal and exterlal migration		(4) only imigration regions		(4) only emigration regions	
	Coefficient	S.E	Coeffiient	S.E	Coeffiient	S.E	Coeffiient	S.E	Coeffiient	S.E
ln(long-term unemployment rate) lagged	0.399 ***	0.069	0.464 ***	0.088	0.589 ***	0.080	0.549 ***	0.115	0.423 **	0.082
net imigration rate			0.202 **	0.103			0.365 *	0.218		
net emigration rate									-0.161	0.158
net internal migration rate					0.285	0.178				
net migration rate from abroad					0.508 **	0.202				
national population growth	1.923 ***	0.778	1.568 **	0.827	1.456 **	0.665	0.201	0.851	1.547	1.387
share of young population	0,252 ***	0.038	0.229 ***	0.049	0.231 ***	0.035	0.189 **	0.552	0.213 ***	0.063
shareof low educated	0.297	0.254	0.201	0.263	0.306	0.239	-0.146	0.355	0.448	0.281
agriculture share	-7.389 ***	2.417	-6.511 **	3.168	-5.533 **	2.837	-4.666	2.996	-3.894	2.642
Ln(Turbulence index)	0.013	0.028	0.023	0.027	0.003	0.029	-0.019	0.037	-0.031	0.033
ln(compensation per employee)	1.091 ***	0.328	0.860 **	0.355	1.086 ***	0.262	0.860 *	0.453	0.396	0.343
ln(Inverse Herfindahl index)	-3.403 **	1.426	-2.767 **	1.355	-2.790 **	1.373	-2.700	2.698	-0.657	1.118
obervations	1704		1704		1055		1305		399	
Tests (P-value)										
Hansen J statistic (overidentification test of all instruments):	0.143		0.219		0.155		0.258		0.213	
Test for Ar(2) residuals	0.089		0.077		0.044		0.327		0.017	

Notes, S.E. = heteroskedasticity robust standard errors, *** (**) (*) signify significance at the 1% (5) (10%) level respectively. All results based on System GMM estimation using a maximum of 2 lags of the independent variables as instruments

Looking at the results of the specification for youth unemployment (see table 4), however, reconfirms much of our previous analysis. As with overall unemployment rates there are also clear tendencies of convergence with respect to youth unemployment rates in Europe in the period from 2000 and 2007 with estimated beta co-efficient lying between -0.4 and -0.3. Furthermore, as for total unemployment rates beta coefficients are hardly influenced by controlling for migration, the minor changes that do occur suggest a moderate decrease when considering the results for youth unemployment, only. This suggests only a mild impact of migration on convergence. Finally, again similar to the results for aggregate unemployment rate growth also results for youth unemployment rates indicate an insignificant correlation of migration with this component of unemployment. Once more these results therefore suggest at most a very mild impact of migration on youth unemployment rates.

Results for the long-term unemployment rate, aside from suggesting rather rapid conditional convergence in long-term unemployment rates, with the estimated beta coefficients ranging between -0.6 and -0.4, however, indicate that a higher migration to an EU region also significantly increases the long-term unemployment rate. This thus suggests that the additional labour market competition of newly arriving migrants primarily works to the detriment of the long-term unemployed.. According to the estimated coefficient a 1 percentage point increase in the migration rate to a region increases the long-term unemployment rate by 0.2 per cent.

In addition this statistically significant impact of net migration to a region on long-term unemployment is due solely to the impact of migration from abroad (see column (3) of table 5). While internal migration has a positive but statistically insignificant effect on the long-term unemployment rate, the coefficient on foreign migration is positive and significant. The point estimate of the coefficient here implies that an increase of the migration rate from abroad by 1 percentage point increases the long-term unemployment rate by 0.5 per cent. Finally, estimation results for the sample split by emigration and immigration regions, on account of a substantially reduced number of observations leads to an only marginally significant effect of migration on long-term unemployment in immigration regions only. Here higher immigration by 1 percentage point increases unemployment by 0.4 per cent. For emigration regions by contrast the effect remains insignificant. This may however, be due to the substantially lower number of observation available in this estimate.

6.2 Results for GDP Per Capita Convergence

In sum thus evidence so far implies an only minor impact on migration on unemployment, with the only indication of a statistically significant impact applying to a potential increase in long-term unemployment. The results for GDP per capita (reported in table 6), however, point in a slightly different direction. They first of all also imply conditional convergence although at a much lower rate than for unemployment among the EU NUTS2 regions in our period of observation. The estimated beta coefficient here is around -0.1 (but significantly differently from 0) in all specifications except for the case where we focus on emigration regions only. [21]

[21] Our beta coefficient is thus substantially larger than the famous 2 per cent found by Barro and Sala-i-Martin (1991). The reason for this is, however, that due to controlling for region fixed effects and other independent variables we are considering conditional convergence here. When we exclude these controls and focus on unconditional convergence only we get a (highly significant) beta coefficient of -0.023 which is close to the annual 2 per cent postulated in most of the literature.

Table 6: Convergence in Per Capita Income (PPS and Effect of Total Net Migration

	(1) excluding migration		(2) Including migration		(3) seperating internal and exterlal mig		(4) only imigration regions		(4) only emigration regions	
	Coefficient	S.E	Coeffiient	S.E	Coeffiient	S.E	Coeffiient	S.E	Coeffiient	S.E
ln(gdp per capita at pps) lagged	0.907 ***	0.026	0.910 ***	0.027	0.925 ***	0.025	0.969 ***	0.040	0.635 **	0.027
net imigration rate			0.033 ***	0.007			0.023 **	0.012		
net emigration rate									-0.023 **	0.009
net internal migration rate					0.007	0.013				
net migration rate from abroad					0.014 **	0.006				
investment share in GDP	0.144 ***	0.047	0.140 ***	0.052	0.151 **	0.072	0.141 **	0.058	0.238 **	0.113
natural population growth	0.032	0.036	0.036	0.042	-0.050	0.049	0.092	0.103	0.321	0.325
share of young population	-0.994 **	0.288	-0.995 **	0.424	-1.169 **	0.516	0.287	1.160	-3.034	2.649
shareof highly educated	0.206	0.138	0.202	0.133	0.081	0.095	0.408 ***	0.128	0.958 *	0.559
agriculture share	-0.231 **	0.116	-0.270 **	0.129	-0.316 **	0.146	-0.026	0.355	-0.624 **	0.303
Ln(Turbulence index)	0.011 ***	0.003	0.012 ***	0.003	-0.001	0.003	0.013 **	0.005	-0.004	0.013
obervations	1712		1712		1072		1308		404	
P-values										
Hansen J statistic (overidentification test of all instruments):	0.334		0.626		0.132		0.777		0.054	
Test for Ar(2) residuals	0.211		0.137		0.330		0.082		0.015	

Notes, S.E. = heteroskedasticity robust standard errors, *** (**) (*) signify significance at the 1% (5) (10%) level respectively. All results based on System GMM estimation using a maximum of 2 lags of the independent variables as instruments

Also in accordance with the vast majority of the literature, investments have a significant positive and the share of young persons (which may be considered a proxy for labour supply growth) a significant negative impact on GDP per capita, while natural population growth, on account of its co-linearity with the share of young population has no additional significant impact. In addition, a low share of agriculture and (in most specifications) a more rapid structural change are also conducive of high GDP per capita growth, while the share of highly educated has a significant impact on GDP growth only when splitting the sample into emigration and immigration regions

From the point of view of the objectives of this paper, however, more importantly migration even after controlling for endogeneity has a positive impact on the GDP per capita in the receiving region.[22] Here the point estimates of the coefficient suggest that an increase in the migration rate by 1 percentage point increases GDP per capita at purchasing power by 0.02 per cent. This finding thus corroborates the conclusion of much of the literature that on average migration has a weakly positive effect on average GDP per capita growth (which could for instance be theoretically explained by the human capital gain implied by migration, complementary with existing skills and the additional regional demand it induces).

When splitting the sample into immigration and emigration regions we find that immigration has a positive impact in the first case and emigration a negative impact on the later regions. In particular a 1 per cent increase in the net immigration reate of immigration regions leads to a 0.02 per cent increase in GDP per capita and in emigration regions an equivalent increase in the emigration rate reduces GDP per capita by 0.02 per cent. Migration flows therefore tend to increase regional disparities.

Furthermore - also in accordance with previous literature – the impact of including the migration variable in the GDP per capita equation hardly changes the convergence (beta) parameter and if anything increases rather than decreases this. In the convergence equation excluding the migration rate this parameter is -0.093, while it is slightly larger (-0.090) with migration.

6.3 Results for Productivity Convergence

The effects of migration on GDP per capita can be considered as a combined effect including supply and demand side effects of migration. Supply side effects in this respect may result from productivity changes due to changes in the skill structure and demand side effects from additional demand of migrants. In order to disentangle these effects and to provide some evidence on the impact of migration on the competitiveness of regions we therefore also estimate the impact of migration on productivity.

[22] Again this result is highly robust across different specifications. In particular (in results not reported here) we also estimated the specification with other instrumental variable techniques as well as without controlling for endogeneity. In all of the equations the positive co-efficient was found.

Table 6: Convergence in Productivity (Real GDP per employed)

	(1) excluding migration		(2) Including migration		(3) seperating internal and exterlal migration		(4) only imigration regions		(5) only emigration regions	
	Coefficient	S.E	Coeffiient	S.E	Coeffiient	S.E	Coeffiient	S.E	Coeffiient	S.E
ln(productivity) lagged	0.65 ***	0.06	0.65 ***	0.07	0.69 **	0.06	0.66 ***	0.11	0.55 ***	0.12
net imigration rate			0.02 ***	0.01			0.01 *	0.01		
net emigration rate									-0.03 **	0.01
net internal migration rate					-0.02	0.04				
net migration rate from abroad					0.02 ***	0.01				
investment share in GDP	0.15 **	0.06	0.15 **	0.07	0.19 **	0.08	0.15 **	0.07	0.23 ***	0.07
ln(Unemployment rate)	0.07 ***	0.03	0.08 ***	0.03	0.05 ***	0.02	0.07 **	0.03	0.03	0.04
share of young population	-1.38 **	0.54	-1.36 **	0.56	-1.02 **	0.43	-1.36 **	0.69	-1.36	1.45
shareof highly educated	-0.27	0.18	-0.32 *	0.17	-0.13	0.14	-0.26 *	0.16	-1.36 **	0.59
agriculture share	-0.52 **	0.17	-0.51 ***	0.16	-0.52 ***	0.16	-0.50 **	0.23	-0.34	0.29
Ln(Turbulence index)	0.01	0.00	0.01 *	0.00	0.01 *	0.00	0.01	0.01	0.01	0.01
obervations	1712		1796		1055		1308		404	
P-values										
Hansen J statistic (overidentification test of all instruments):	0.106		0.110		0.166		0.740		0.548	
Test for Ar(2) residuals	0.032		0.022		0.059		0.065		0.009	

Notes, S.E. = heteroskedasticity robust standard errors, *** (**) (*) signify significance at the 1% (5) (10%) level respectively. All results are System GMM using a maximum of 2 lags of the independent variables as instruments

Table 6 presents the results of this regression. Once more this regression points to strong tendencies of productivity convergence among the European NUTS2 regions in our observation period. The estimated coefficient on the lagged productivity level ranges between 0.65 and 0.69, in all regressions focusing on the full sample of regions (and differs from this only when focusing on emigration regions). This implies a beta coefficient of -0.30 to -0.35. Furthermore, we once more find that the convergence parameter is hardly affected by the inclusion of the net migration rate in our regression. Thus migration has only a weak impact on productivity convergence.

As with the GDP per capita convergence, however, migration after controlling for endogeneity has a positive impact on productivity in the receiving region. The point estimates of the coefficient indicate a slightly smaller impact of migration on productivity growth than in the case of GDP per capita growth. An increase in the migration rate by 1 percentage point increases GDP per capita at purchasing power by 0.02 per cent. Once more this is primarily due to a significant positive impact of migration from abroad on productivity, while the impact of internal migration remains statistically insignificant (but also positive). In addition a further division of the sample into emigration and immigration regions suggests that this effect is negative in emigration and positive in immigration for regions. Emigration regions therefore loose while immigration regions gain skills.

Finally, as already in the GDP per capita growth equation also results for this dependent variable imply that a high share of investments in GDP increases, while a high share of young population and a high share of agriculture in employment reduces productivity.

7. Conclusions

Given that immigration is faced by almost all European countries and that it can potentially affect unemployment and income levels as well as the speed of convergence in living standards among regions, which are all major concerns of cohesion policy, this study conducted an empirical, econometric analysis covering all EU27 regions in the 2000-2007 period, which is characterized by important changes in the relevant indicators.

First, we analyse to which extent migration affects unemployment, GDP per capita growth and productivity growth which we consider an indicator for competitiveness of a region. In addition, in the case of regional unemployment we also distinguish between youth and long-term unemployment. Second we estimate the effects of migration in the case of immigration and emigration regions.

Our descriptive evidence suggests that the NUTS2 regions in the period from 2000 to 2007 converged with respect to per capita income, productivity and unemployment. This also applies to the indicators on the structure of unemployment (i.e. youth unemployment and long-term unemployment). While regional disparities are large in Europe they thus have unambiguously reduced in the last decade. Furthermore, we find that most NUTS2 regions of the EU were characterised by convergent development in this time period. Most of the EU NUTS2 regions were characterised either by income below EU average in 2000 and an above average growth rate in 2000-2007 (converging from below) or by an above average initial income and below average growth (converging from above). The major share of Eastern European regions and the Iberian Peninsula were converging from below. Only Southern Italy, the major part of Greece, several East German regions, the North of the Czech Republic and the South of Hungary were diverging from below. The main share of EU15 was converging from above and a small

part of EU15 (Ireland, the North-East of Spain, Cyprus, some regions of Belgium and the Netherlands as well as the majority of Finnish regions) were diverging from above. Also we find that the majority of NUTS2 regions in the EU were net immigration regions (with the net emigration regions encompassing almost all of Romania, the major part of Poland, Latvia and Lithuania, the peripheral regions of Sweden and Finland, Southern Italy and Northern France).

In our econometric analysis, we cannot find a significant impact of migration on the regional unemployment rate growth, however, migration has a significant but small effect on long-term unemployment rate growth. Our coefficient estimates imply that a 1 per cent increase in migration induces a 0.2 per cent increase in long-term unemployment. This effect, however, is restricted to immigrant regions, only.

Migration, however, has a significantly positive impact on both GDP per capita and productivity growth in immigration regions. The coefficients suggest that a 1 percentage point increase in immigration to immigration region increases GDP per capita by about 0.02 per cent for GDP per capita as well as for productivity. For emigration regions an increase in the emigration rate leads to a reduction of 0.02 per cent in GDP and 0.03 per cent in productivity.

Finally, our results highlight the differential impacts of different migrants. Due to severe data constraints in measuring the structure of migration at the regional level these results are less robust and should be interpreted with some care. Nonetheless they indicate that the significant effect of overall migration on long-term unemployment rates arises primarily from foreign migrants, For the GDP per capita and productivity growth, we find as well that international migration is responsible for the growth increasing effect of immigration.

Although our data does not permit us to analyse the impact of different groups of migrants, our results provide indirect evidence that migration can be viewed as a transfer of human capital to immigration regions and thus increases regional growth and productivity. Since immigration regions are, however, also often regions with above average GDP and productivity while emigration regions in Europe practically all have below average GDP, migration seems to induce divergence rather than convergence at a regional level.

8. References

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Annex I

Table A1: Data availability and structural breaks in the European Labour Force Survey

Country	Regions	Years	Breaks due to method		Breaks due to census or definitions	
Austria	9	1995-2008	1999	**2004**	2003	
Belgium	11	1996-2008	1999		-	
Bulgaria	6	2006-2008	-		-	
Cyprus	1	2000-2008	2004		-	
Czech	8	2002-2008	-		-	
Denmark	1	1995-2008	1999		2007	
Estonia	1	1998-2008	2000		-	
Spain	19	1995-2008	1996	1999	2005	2001
Finland	5	1999-2008	1998	2000	-	
France	22	1995-2008	2003		2003	
Greece	13	1995-2008	1996	1998	2004	
Hungary	7	2001-2008	2003		-	
Ireland	2	2006-2008	-		-	
Italy	21	2005-2009	-		-	
Lithuania	1	1998-2008	2002		1998	
Luxemburg	1	1995-2008	2003	2007	-	
Latvia	1	2004-2008	-		-	
Malta	1	2005-2008	-		-	
Netherlands	12	1999-2008	2000		2003	
Poland	16	2004-2008	-		-	
Portugal	7	1999-2008	-		-	
Romania	8	2004-2008	-		-	
Slovenia	2	2002-2008	-		-	
Sweden	8	1999-2008	2001		2005	
Slovakia	4	2003-2008	-		-	
UK	37	1999-2008	-		-	

Source: ELFS, http://circa.europa.eu/irc/dsis/employment/info/data/eu_lfs/index.htm, own calculations

Annex II

Table A2: Variable names and sources

Code	Name	Source
lnurtdi	log growth of unemployment rate	EUROSTAT
lnurydi	log growth of youth unemployment rate	EUROSTAT
lntltudi	log growth of long-term unemployment rate	EUROSTAT
lngdpdi	log growth of GDP per capita (at PPS)	EUROSTAT
Lnurt	log of total unemployment rate	EUROSTAT
Lnury	log of youth unemployment rate	EUROSTAT
Lnltu	log of long-term unemployment rate	EUROSTAT
Lnnat_ur	log national unemployment rate	EUROSTAT
Net_mig_r1	Net migration rate in % of total population	EUROSTAT
net_int_mr	net internal migration rate in per cent of total population	EUROSTAT
net_for_mr	net external migration rate in per cent of total population	EUROSTAT
nms_mig_r	change in active aged foreign born from the EU12 in per cent of active population	ELFS
old_mig_r	change in active aged foreign born from the EU15 in per cent of active population	ELFS
oth_mig_r	change in active aged foreign born from third countries in per cent of active population	ELFS
low_mig_r	change in active aged low skilled foreign born in per cent of active population	ELFS
med_mig_r	change in active aged medium skilled foreign born in per cent of active population	ELFS
high_mig_r	change in active aged high skilled foreign born in per cent of active population	ELFS
Lnyoungsh	log of the share of under 25 year olds in population	EUROSTAT
lnlowedsh	log of share of low educated in total work force	EUROSTAT
lnhighedsh	log of share highly educated in total workforce	EUROSTAT
natpopgr	log of natural population growth in age 15-65	EUROSTAT
lnprate	log of economically active in total population aged 15-64	EUROSTAT
lnagsh	log of share of aggricultural employed in total employment	EUROSTAT
Lnindsh	log of share of industrial employed in total employment	EUROSTAT
lnturb	Turbulence index (share of sectoral employment share changes in one year)	EUROSTAT
lnherf_inv	Inverse Herfindahl Index (Inverse sum of squares of sector shares)	EUROSTAT
lncompdi	log of growth of compensation per employee	EUROSTAT
lnprod	log GDP per employed	CAMBRIDGE ECONOMETRICS
invest	gross fixed capital formation as share of GDP	EUROSTAT